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ORIGINAL ARTICLE

Comparison between Bilateral Internal Mammary Artery Graft and Left Internal Mammary Artery Graft in Patients Undergoing Coronary Artery Bypass Grafting

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ABSTRACT

Background: Increasing evidence continues to demonstrate a survival advantage for bilateral internal mammary artery (BIMA) over Left internal mammary artery for coronary artery bypass grafting (CABG). However, there are still uncertainties about which surgical approach is the best one to use with BIMA grafting.

Objective: To compare Bilateral Internal Mammary Artery (BIMA) Grafting with Left Internal Mammary Artery (LIMA) Grafting during Coronary Artery Bypass Grafting (CABG) in terms of early mortality and sternal wound infections.

Materials & Methods Randomized: control trialtechnique enrolled. The study was conducted at the Cardiac Surgery Department, King Edward Medical University (KEMU), Mayo Hospital Lahore

Results: Total 96patients undergoing CABG were included in this study. Patients were randomly divided into 2 groups; each group contains 48 patients. Group A included patients having Left IMA to LAD; second and third graft by Great Saphenous Vein and Group B included patients having Bilateral Internal Mammary Arteries with Left IMA to LAD or OM and Right IMA to RCA, LAD or Ramus Intermedius. The superficial and deep sternal wound infections was recorded along with the different risk factors including diabetes, obesity, hypertension, smoking and use of inotropes intra-operatively and post operatively. The incision site over the sternum was being evaluated on daily basis throughout the stay of the patients (from 5–8 days). Diagnosis of Sternal infections was based on the presence of positive cultures, dehiscence of the sternum incision, fever, redness pain, and infected (purulent) secretions. Sternal instability and discharge, ventilation time, length of ICU stay, chest drainage, re-exploration and length of hospital stay was also recorded.

Results: Not any of the patients included in these two treatment groups suffered from mortality (LIMA: 0%, BIMA: 0%). Deep sternal wound infection [LIMA: 4.17% & BIMA: 6.25%, p-value=0.646] and superficial wound infection [LIMA: 4.17% & BIMA: 6.25%, p-value=0.646] did not show any statistically significant association towards both grafts type. Patients who underwent BIMA grafting suffered from higher in hospital stay as compared to patients who underwent LIMAgrafting. i.e. [LIMA: 7.02 & BIMA: 8.02, P value = 0.000]

Conclusion: Results of the study showed no significant difference for deep sternal wound infection and superficial wound infection between the two grafts BIMA and LIMA. However, patients who underwent BIMA grafting had significantly higher hospital stay as compared to patients who underwent LIMA grafting.

Keywords: Bilateral, Internal, Mammary Artery, Grafting, Left, Internal Mammary Artery, Coronary Artery, Bypass, Grafting, Mortality, Sternal wound infections.

INTRODUCTION

Coronary Artery Bypass Grafting is the most commonly performed technique for coronary revascularization these days. The conventional technique being performed these days for surgical revascularization of the heart includes using Left IMA to overcome stenosis in LAD Artery and using Great Saphenous Vein to overcome stenosis in the other coronary arteries.(1)

There is no agreement as to which arterialconduit namely Right Internal Mammary Artery (RIMA), Radial Artery (RA) and Right Gastro Epiploic Artery (RGEA) may be used after Left Internal Mammary Artery. Though Angiographic studies prove markedly superior patency of Bilateral Internal Mammary Artery grafts as compared with the vein grafts, with patency rates of Bilateral IMA grafts presence being as high as 98% at 7th day and 95% at 2nd and 7th year.(2-4) The usage of Right IMA in addition to Left IMA has shown to improve the survival by 5% at 10 years when only Left IMA and venous grafts were used.(5) However, some surgeons are not using Right IMA for the fear of DSWI, relatively short length of in situ Right IMA limiting the target areas and increased operating times.(6)

Bilateral IMA (Bilateral Internal Mammary Arteries) commonly remain underuse in CABG. Though previous studies have been established a longstanding advantage of the usage of Bilateral IMA on Left IMA-only, verification of these outcomes is missing in a current surgical experience. Bilateral IMA grafting has been revealed significantly improve clinical results and increase in the longstanding survival, in patients with CKD, diabetic patients and in even patients who are seventy years old or less.(5, 7-10)

Hanif HM et al showed thatthere is no rise in the risk of Sternal Wound infection with Bilateral IMA grafting, while others inform an amplified incidence of SWI most commonly in diabetic patients.(11) Even though the risks involved, Bilateral IMA grafting seems to be highly effective at short and long-term survival.(12, 13)

MATERIAL AND METHODS

Inclusion Criteria: Patients with age ≤ 60 years and Undergoing primary, elective coronary artery bypass surgery. They should have graft able double or triple vessel disease

Exclusion Criteria: Patients having redo surgeries. Patients have concomitant valve surgery. Patients undergoing urgent emergency surgery. Patients in cardiogenic shock preoperatively requiring intra-aortic balloon. Obese particularly female patients. Patients of COPD. Patients having diabetes mellitus

Ethical Considerations: Informed consent was taken from all the participants. All the study participants were announced about the purpose of the study and finally, verbal consent was obtained before data collection.

Operational Definition: **Data Collection Tools**: The questionnaire was developed by the authors, and data was collected using a self-administered structured questionnaire.

Data Analysis: Data i analysis was done by using SPSS version 20. The quantitative variables were presented in the form of mean ± S.D while frequency and percentage was given for qualitative variables. Mortality, sepsis and infections were compared by using chi square test. Postoperative hospital stay was compared by using independent sample t-test/ Mann Whitney U Test. P-value of less than 0.05 was taken as significant.

RESULTS

Table no. 1: Patient's Age

	Group A	Group B
N	48	48
Mean	47.43	44.54
SD	7.13	7.40
Minimum	35	34
Maximum	58	58

Group A: Left internal Mammary Artery
Group B: Bilateral Internal Mammary Arteries

Table no.2: Patients Gender within the Treatment Groups

	Group A	Group B	Total no.
Male Patients	31(64.58%)	32(66.67%)	63
Female Patients	17(35.42%)	16(33.33%)	33
Total	48	48	96

Group A: Left internal mammary artery
Group B: Bilateral Internal Mammary Arteries

Table no.4: Deep Sternal Wound Infection in Groups

DSWI	Group A	Group B	Total no.
Yes	2(4.17%)	3(6.25%)	5
No	46(95.83%)	45(93.75%)	91
Total	48	48	96

Group A: Left Internal Mammary Artery
Group B: Bilateral Internal Mammary Arteries
Chi Square Test= 0.211
P-value= 0.646

Table no.5: Superficial Wound Infection in Groups

SWI	Group A	Group B	Total no.
Yes	2(4.17%)	3(6.25%)	5
No	46(95.83%)	45(93.75%)	91
Total	48	48	96

Group A: Left Internal Mammary Artery
Group B: Bilateral Internal Mammary Arteries
Chi Square Test= 0.211
P-value= 0.646

Table no.6: Post Surgery Length of Stay in Hospital

	Group A	Group B
N	48	48
Mean	7.02	8.02
SD	0.81	1.43
Minimum	6	6
Maximum	8	10
t-test=-4.21 , p-value<0.0001		

Group A: Left Internal Mammary Artery
Group B: Bilateral Internal Mammary Arteries

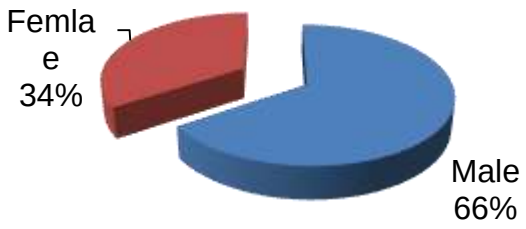

Figure-1: Gender of patients in study Population (n=96)

Mean age of patients in Group A and Group B was 47.43±7.13 and 44.54±7.40. Group A had the minimum and the maximum age limit as 35 and 58 while in Group B had 34 and 58 years as the limits in study population 66% were male patients and 34% were female patients. In Group A 31(54.58%) were male patients and 17(35.42%) were female patients whereas in Group B 32(66.67%) patients were male and 16(33.33%) were female. (Table-1)

DISCUSSION

The opinion of having Bilateral IMA grafting in CABG surgery has remained a topic of discussion since Left IMA grafting confirmed to be advantageous in terms of long lasting outcomes as compared to venous grafting.[14] New investigations, such as ART have recognized similar short term and medium-term clinical outcomes,[6,15,16] in disparity to the enlarged longstanding clinical outcomes with Bilateral IMA grafting revealed in some other investigations and reviews.

Previous appraisals had acquainted greater late survival advantage in Bilateral IMA grafting, whereas, some new investigations have appeared since these reviews were being carried out.[17,18] Additionally existing studies on long-term outcome, without full analysis of additional temporary and longstanding patient morbidities. Regardless of the recognized existence benefits of Bilateral IMA, temporary morbidities continued to be a reason specified by numerous to avoid Bilateral IMA grafting.

Though Bilateral IMA grafting it appears to offer greater revascularization, it is theoretically more challenging, and uncertainties that it talks about a longer operation and increases the risk of early mortality and morbidity, reduced wound healing, have forbidden general usage.[19,20]

Bilateral IMA grafting is simply utilized regularly in about 10% of the patients of CABG in Europe18 and 4% of the patients of CABG in the USA.[21]

In this study no one of the patients expired in two study groups. i.e. Group A (LIMA): 0.0 % & Group B (BIMA): 0.0 %. According to the findings of ART rate of mortality at 30 days with use of Bilateral IMA was 1.2%. Indeed, in a vast meta-analysis of 27 observational studies by Weiss et al., a significant upsurge in long-term survival was reported in patients undertaking bilateral mammary artery (BIMA) grafting when compared with the patients undergoing only LIMA grafting.[22]

Deep sternal wound infections can be a serious, life-threatening disease due to the damaging of the sternal microcirculation during the harvesting process. In fact, concurrent harvesting of both IMAs may harm sternal perfusion and compromise the wound healing process, especially in patients suffering from diabetes mellitus, chronicobstructive pulmonary disease or obesity.[6]

In this study no significant difference was seen for deep sternal wound infection between Left IMA & Bilateral IMA. i.e. Left IMA: 4.17% & Bilateral IMA: 6.25%, p-value=0.646.

Recently in 2017 Sana N Buttar in his Meta-analysis stated that Bilateral IMA was linked with a 1.3% increase in the occurrence of reconstruction of sternal wound.[23] Ravaux JM in his study established a global incidence of Sternal Wound Infection of 4% for Bilateral IMA patients. Deep Sternal Wound Infection stated in this study was greater as that of reported by N Buttar and Ravaux JM.

The threat of reduced wound healing can remain to be lessened with type of patient choice (avoiding Bilateral IMA grafting in diabetic patients , obese patients or persons with respirational impairment) and alteration of the Internal Mammary Artery separation method whereby selecting only the Internal Mammary Artery ('skeletonized') rather than the pedicle IMA, conserves collaterals and blood supply of sternum and progresses wound healing, mainly in patients with diabetes.[24-25]

Similar findings were observed by David P. Taggart who demonstrated that the usage of Bilateral IMA grafts augmented, on an average, duration of operation to be 23 minutes and 1 hour and 45 min to the ventilator support but did not suggestively disturb the period of ICU stay or post-surgery period of hospital stay. [6]

Batric Popovic in his study examined the existence benefit of bilateral internal mammary artery (BIMA) grafts in patients having left ventricular dysfunction. His findings presented no significant difference of hospital stay for Bilateral MI and Left IMA-SVG groups. i.e. 8.2(7-11) & 9.3 (6-12), p-value=0.12.[26]

CONCLUSION

Results of this study showed that there was no significant difference for mortality, deep sternal wound infection and superficial wound infection between the two grafts techniques. i.e. Bilateral IMA and Left IMA. However, in case of hospital stay, the patients who had Bilateral IMA grafts had significantly higher hospital stay as compared to patients who underwent Left IMA graft. It should be kept in mind that the longer benefits of Bilateral IMA compensate its temporary risks, and it must be a more regularly utilized approach for CABG surgery.

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